# HANDBOOK OF AGRICULTURAL

# CONSERVATION PRACTICES

PHOTOS AND DESCRIPTIONS
WITH FOOD SAFETY CONSIDERATIONS

RESOURCE
CONSERVATION DISTRICT

**CENTRAL COAST RESOURCE CONSERVATION DISTRICTS**

Handbook of Agricultural Conservation Practices
Photos and Descriptions with Food Safety Considerations

3rd Edition, 2012
Spanish translation by Sacha Lozano and Deborah Nares (RCDSCC).
Formatted and edited by Stacie Ruffoni and Nik Strong-Cvetich (RCDSCC).

Funding for the translation and reformatting of this booklet was provided by USDA: Outreach and Assistance to Socially Disadvantaged Farmers and Partners Grant Program and the Department of Conservation.

Additional printing funded by the Resource Conservation District of Ventura County and the Resource Conservation District of Santa Cruz County.

2nd Edition, 2009
Revised and edited by Monica Martinez, Melanie Beretti & Paul Robins (RCDMC).

Funding for the update and revision of this booklet was provided by a Contribution agreement from USDA-NRCS: Reconciling Food Safety and Environmental Protection, Agreement No. 65-9104-7-611 with contribution from the Central Coast Resource Conservation & Development Council.

Special thanks and recognition to all our professional colleagues of the Farm, Food Safety, and Conservation Network for their support, insight and guidance.

1st Edition, Spring 2003
Designed and edited by Alicia Parker (RCDMC).

Funding for the development of the original booklet was provided in part by the US Environmental Protection Agency pursuant to Assistance Agreement No C9-989268-99-0 and any amendments thereto which has been awarded to the State Water Resources Control Board for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the USEPA or the SWRCB.

All images were provided by staff of RCDMC, USDA NRCS and the Community Alliance with Family Farmers, unless otherwise noted.



Resource Conservation District of
Monterey County
744-A La Guardia Street, Salinas, CA 93905
Phone: 831-424-1036 ext. 124
Fax: 831-424-7289
email: info@rcdmonterey.org
www.rcdmonterey.org

Resource Conservation District of
Santa Cruz County
820 Bay Avenue, Suite 136, Capitola, CA 95010
Phone: 831-464-2950
Fax: 831-475-3215
email: info@rcdsantacruz.org
www.rcdsantacruz.org

# TABLE OF CONTENTS



*This is not intended as a how-to guide. Individual practices must meet minimum standards and comply with local laws and regulations. The information contained is not an exhaustive review of all information available and represents only a sampling. For more information contact your local RCD or NRCS office.*

# INTRODUCTION

This handbook was created to provide a pictorial resource for communicating with growers and others interested in conservation project implementation. As such, the handbook is a compilation of images and descriptions of commonly recommended conservation practices used to improve resource management for agriculture that in turn create benefits for the overall environmental condition of our region. While the first edition included only practice descriptions, this second edition has been modified to include food safety considerations specifically relevant to those practices . Each practice is presented in two pages, the first in pictures as installed locally and the second providing brief narrative description of the practice and associated food safety 'co-management' considerations. The latter information is summarized from a more thorough RCDMC document: Food Safety Considerations for Conservation Planners: a Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information, which is available from the RCD of Monterey County's website at www.rcdmonterey.org.

More detailed information for project planning including approved standards and specifications for each individual practice is available from your local RCD and NRCS Field Office Technical Guide. Each practice referenced in this Handbook includes the corresponding NRCS Practice Code Number for reference in the Field Office Technical Guide. The food safety references are strictly limited to those potentially associated with implementation of conservation practices in an agricultural context, and are summarized under the three relevant categories of potential pathogen vectors (air, water and animals) along with general considerations relevant to management of the specific practice. Please see the Field Guide noted above for more thorough and referenced information regarding food safety and water quality co-management.

'Co-managing' for food safety and agricultural water quality has become increasingly important to the planning and implementation of conservation practices in recent years due increasing demands on growers to manage for both considerations with an apparently limited suite of compatible practices. This is especially relevant on the Central Coast, which supports a diversity of leafy green and other vegetable crops that are consumed raw or are minimally processed. For these crops, food safety management is critical and has intensified under public concern after the 2006 spinach E. coli 0157:H7 outbreak with a resulting concern regarding potential negative impacts of conservation practices involving water impoundment and non-crop vegetation on food safety management. At the same time, the Central Coast remains a region where runoff water quality has gained increased interest from regulatory agencies such as the Regional Water Quality Control Board. As a result, growers are pinched between apparently contradictory demands. The information in the above-referenced Field Guide and summarized in this handbook is intended as a resource to support land managers desiring co-management of both issues.

This handbook is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. Similarly, this guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program. Please refer to the Technical Assistance Contact Page for more information on conservation technical resources.

PRACTICE BENEFITS

The benefits of each practice will be identified with the following icons:


HABITAT


PEST CONTROL


NUTRIENTS


EROSION CONTROL


WATER QUALITY/ SUPPLY

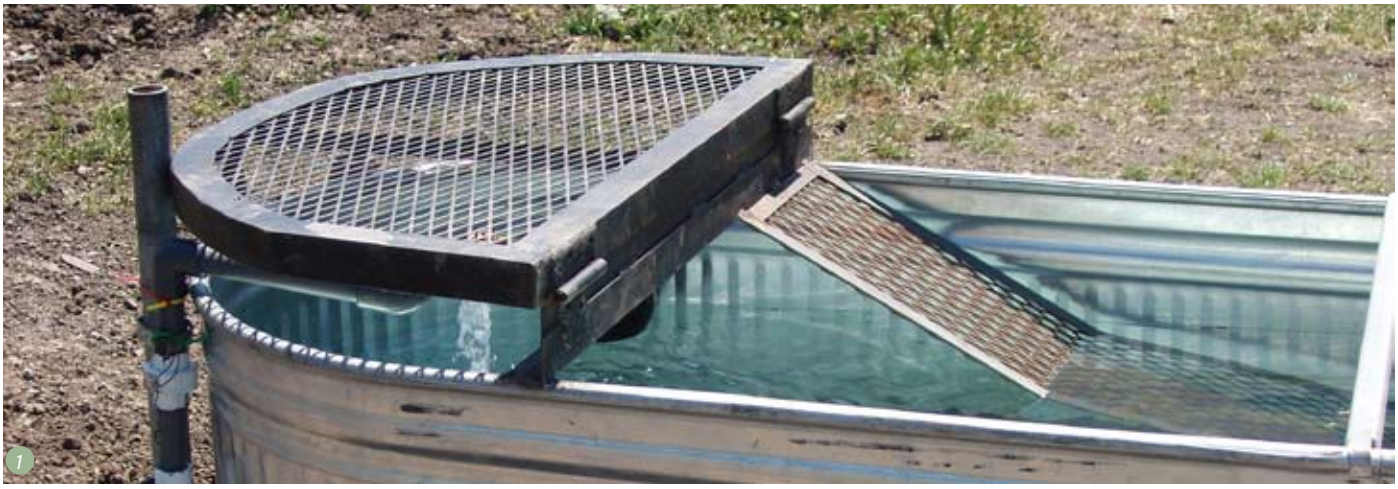
# CATTLE TROUGH

NRCS STANDARD PRACTICE CODE — 614

**Definition:** A trough or tank, with needed devices for water control and wastewater disposal, installed to provide drinking water for livestock.

**Purpose:** To provide watering facilities for livestock at selected locations that will protect vegetative cover, streams and wetlands. Troughs serve as an alternative water source and reduce the impact of livestock on natural waterways.

**Criteria:** Adequate capacity to meet the water requirements of the livestock. Include the storage volume necessary to carry over between periods of replenishments. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 614).




*Cattle trough with animal escape ramp*


*Cattle trough with animal escape ramp on a concrete apron*

# CATTLE TROUGH

## FOOD SAFETY CONSIDERATIONS

**Water:** Cattle troughs provide a water source that aids in maintaining livestock in predetermined upland locations and reduces the presence of livestock around waterways and thereby lessens the risk of surface water contamination. Proper placement (away from natural waterways and cropland) and maintenance of cattle troughs will significantly reduce the presence and movement of pathogens though the landscape and natural waterways. By reducing the input of sediment into waterways, cattle troughs may also reduce the risk of downstream sediment accumulation and flooding.

**Air:** Cattle troughs may increase the potential for air-born movement of pathogens by increasing animal densities. High numbers of animals damage vegetation immediately surrounding the trough, and their associated feces may become pulverized and air-born.

**Animals:** Cattle troughs have the potential to attract wild and domestic animals for watering and possibly breeding (amphibians and insects, only). Water residence time and the quantity of water present in the trough may also be a determining factor for the timing and frequency in which animals may be present in or near the practice. Cattle troughs do not serve as primary habitat for any Animals of Significant Risk (as defined by LGMA* Board accepted Metrics), however, these species can be attracted to cattle troughs as a water source. Animals not considered of Significant Risk (by the LGMA Metrics) potentially associated with cattle troughs include amphibians, wild and commensal birds, small and large mammals, and insects.

**LGMA = Leafy Greens Marketing Agreement*

## DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Cattle trough placement should reduce access of livestock and animals to waterways and proximity to cropland; upland sites away from waterways, swales and fields that grow fresh produce are ideal. Include a vegetated filter strip or protect naturally-vegetated grassland downslope of the trough to intercept overland flow from areas of concentrated manure around trough. Placing gravel or other ground protection around a trough can reduce potential for wind-borne movement of pulverized manure and dust.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# CONSTRUCTED WETLAND

NRCS STANDARD PRACTICE CODE — 656

**Definition:** A constructed shallow water ecosystem designed to simulate natural wetlands.

**Purpose:** To reduce the pollution potential of runoff and wastewater from agricultural lands prior to release to water.

**Criteria:** Practice shall be designed as surface flow system consisting of adequate seepage control, a suitable plant medium, hydrophytic vegetation, and the structural components needed to contain and control flow. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 656).

*Before construction: A site dominated by weeds where ponded water did not collect.*

*After construction: Wetland*

# CONSTRUCTED WETLAND

## FOOD SAFETY CONSIDERATIONS

**Water:** Constructed wetlands can effectively capture and treat water that contains pathogens and reduce flooding.

**Air:** A properly-designed constructed wetland can reduce wind-borne erosion and may reduce the movement of sediment-associated pathogens when they incorporate bank or only intermittently wetted plantings.

**Animals:** A properly-designed constructed wetland has the potential to attract wild and domestic animals for feeding, watering, breeding, and/or migration. Wildlife attraction to wetlands is strongly determined by the type of vegetation used, proximity to other open water sources, and water quantity and residence time. Of the wild (non-domestic) Animals of Significant Risk (as defined by LGMA* Board accepted Metrics)—deer and feral pigs—constructed wetlands do not serve as primary habitat for any of these species. However, because of its potential as a food source and shelter, vegetation used in constructed wetlands may attract animals. Animals not considered of significant risk (by LGMA Metrics) potentially associated with constructed wetlands include amphibians, wild/song and commensal birds, large and small mammals and insects.

**LGMA = Leafy Greens Marketing Agreement*

## DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Constructed wetlands should be designed to incorporate dense ground cover on banks or intermittently wetted areas to minimize on-site dust movement (when dry). Selection of plant materials for constructed wetlands should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. Other methods may be considered as well to deter animal movement into the constructed wetland or into the adjacent cropland should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# COVER CROP

NRCS STANDARD PRACTICE CODE — 340

**Definition:** Grown in row crop systems and vineyards where seasonal benefits of a cover crop are needed. They control erosion, add organic matter and nutrients to the soil, capture and recycle or redistribute nutrients in the soil profile, improve soil tilth and increase infiltration and aeration of the soil. Cover crops have a filtering effect on movement of sediment, pathogens, and pollutants attached to sediment.

**Purpose:** Control erosion when the major crops do not furnish adequate cover. Add organic material to the soil and improve infiltration, aeration, and tilth. Cover crop species can be selected that suppress soil pathogens or pest predator habitat.

**Criteria:** Includes temporary cover crops as well as long term, perennial or reseeding annual cover crops. Selected species must be compatible with the planned management system. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 340).

*Legume and grass cover crop mixture*

*Established Cover Crop*

# COVER CROP

FOOD SAFETY CONSIDERATIONS

**Water:** Cover crops can effectively reduce the transport of pathogens, inhibit their presence in the soil, treat water that may contain pathogens and reduce flooding through reduced erosion and sediment movement.

**Air:** Cover crops can reduce wind-borne erosion and prevent possible transport of dust-born pathogens and may reduce the movement of sediment-associated pathogens.

**Animals:** Cover crops have the potential to attract wild and domestic animals for feeding, breeding, and/or migration. Wildlife attraction to cover crops is strongly determined by the type of vegetation used and proximity to other types of habitat and open water sources. For the wild (non-domestic) Animals of Significant Risk (as defined by LGMA* Board accepted Metrics)--deer and feral pigs--cover crops do not serve as primary habitat and are unlikely to be an attractant for these species. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with cover crops include amphibians, wild and commensal birds (particularly ground nesting birds), small mammals and their predators, and insects.

** LGMA = Leafy Greens Marketing Agreement*

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Consider proximity and connectivity to known habitats and existing animal populations to evaluate the likelihood that certain animals may be able to migrate to the cover cropped site. Selection of plant materials for cover crops should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter or prevent animal movement may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# CRITICAL AREA PLANTING

NRCS STANDARD PRACTICE CODE — 342

**Definition:** Planting vegetation, such as grasses, shrubs and trees on highly erodible slopes.

**Purpose:** To stabilize the soil, reduce damage from sediment and runoff to downstream areas, and improve wildlife habitat and visual resources.

**Criteria:** Use on erodible or critically eroding areas that if left untreated can cause severe erosion or sediment damage. Seeding recommendations can be obtained from your local RCD or NRCS office. Adjust seeding rates to ensure the required amount of pure live seed. Use straw mulch on plantings to anchor seeds in place during germination. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 342).


*Seeded jute-netting covering bare soil to reduce erosion and promote germination*


*Jute-netting with willow stakes above a root-wad revetment and bank toe stabilization with sandbags and placed rock to protect a previously-eroding site*

# CRITICAL AREA PLANTING

FOOD SAFETY CONSIDERATIONS

**Water:** Critical area plantings can effectively reduce pathogen transport in overland flows as well as reduce flooding through reduced erosion and sediment movement.

**Air:** Critical area plantings can reduce wind-borne erosion and prevent possible transport of dust-born pathogens and may reduce the movement of sediment-associated pathogens.

**Animals:** Critical area plantings have the potential to attract wild and domestic animals for feeding, breeding, and/or migration. Wildlife attraction to CAPs is strongly determined by the type of vegetation used and proximity to other types of habitat and open water sources. For the wild (non-domestic) Animals of Significant Risk (as defined by LGMA* Board accepted Metrics)--deer and feral pigs--critical area plantings do not serve as primary habitat and are unlikely to be an attractant for these species. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with CAPs include amphibians, wild/song and commensal birds, small and large mammals, and insects. All of these species may use critical area plantings as habitat, reproduce in or nearby them, and/or utilize them when migrating.

** LGMA = Leafy Greens Marketing Agreement*

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Consider proximity and connectivity to known habitats and existing animal populations to evaluate the likelihood that certain animals may be able to migrate to the CAP site. If animal attraction is a concern, selection of plant materials for CAP projects should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. In general, greater plant species and structural diversity will result in a greater diversity of animals attracted, thereby reducing the likelihood of getting large populations of any single species. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter or prevent animal movement may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# FENCE

NRCS STANDARD PRACTICE CODE — 382

**Definition:** A constructed barrier to animals or people.

**Purpose:** Practice is applied to facilitate the application of conservation practices by providing a means to control movement of animals and people.

**Criteria:** Fences shall be positioned to facilitate management requirements. Height, size, spacing, and type of materials used will provide the desired control and management of animals and people. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 382).

*Fence in disrepair with animal trailing*

*Newly installed fence with double-braced ends and straw-covered critical area planting and berm to disperse water and prevent gullying on this sloped area.*

# FENCE

## FOOD SAFETY CONSIDERATIONS

**Water:** Fences can reduce the likelihood of surface water contamination and possible flooding associated with loss of riparian vegetation by reducing or eliminating domestic animal presence in waterways.

**Air:** Fences may be used to reduce the potential for air-born movement of pathogens to cropland and waterways. Fences may prevent or minimize vegetation loss due to animal impacts as well as physically impede dust movement. Conversely, livestock have the tendency to walk along fence lines, potentially generating a strip of bare, pulverized soil with concentrations of feces or manure, which likewise may become pulverized and air-borne.

**Animals:** Fences, properly designed for the target species, may be effective barriers to prevent movement of all species listed as Animals of Significant Risk (by LGMA Board accepted Metrics). Likewise, livestock trails along fence lines may be used for migration by all of these species. Animals not considered of Significant Risk (as defined by the LGMA* Board accepted Metrics) potentially contained within or behind fences include amphibians, small and large mammals, and some insects. Some large mammals not considered significant risks (by LGMA Metrics) may also use livestock trails along fence lines for migration. Proximity to open water sources and other types of habitat will influence animal visitation.

** LGMA = Leafy reens Marketing Agreement*

## DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Fence design and placement should reduce access of livestock and other high risk animals to waterways and to cropland. Methods to deter or prevent animal movement should target the species of concern while minimizing or avoiding negative impacts to other species and the environment. Fence design and placement should consider the potential for soil erosion and concentrated animal impacts along the fence line; minimizing the possibility that soil, fecal material, and accelerated runoff (and associated pathogens) will arrive, untreated to waterways or cropland. Consider establishing a vegetated filter area or protect naturally vegetated grasslands downslope of the fence to intercept overland flow from areas of concentrated animal impact and manure. Fence design and placement should consider its potential to cause flooding or scour, and fence placement through waterways or within floodplains should be avoided. Unintended consequences of trapping animals and creating landscape-level barriers to migration for wildlife should be avoided.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# FILTER STRIP

NRCS STANDARD PRACTICE CODE — 393

**Definition:** A strip or area of vegetation for removing sediment, organic matter, and other pollutants.

**Purpose:** To remove sediment and other pollutants from sheet flow runoff by processes such as filtration, deposition, infiltration, absorption, and volatilization, thereby reducing pollution and protecting the environment.

**Criteria:** Apply this practice on cropland at lower edge of field, in areas requiring filter strips as part of a system to treat polluted runoff. Appropriate filter strip size is related to the type of pollutants being filtered, the filter strip slope and the drainage area being treated. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 393).

*Filter strip separating crops from wetland area*

*Filter strip buffering river from crop land*

# FILTER STRIP

## FOOD SAFETY CONSIDERATIONS

**Water:** Filter strips can effectively reduce the transport of pathogens, treat water that may contain pathogens and reduce flooding through reduced erosion and sediment movement. A properly designed filter strip can be used to effectively reduce the movement of potentially contaminated soil as well as capture and treat potentially contaminated water prior to reaching crop land or other water bodies. By reducing excessive runoff and the input of sediment into waterways, filter strips may also reduce the risk of downstream sediment accumulation and flooding, a potential food safety risk if contaminated water comes into contact with crop surfaces.

**Air:** Filter strips can reduce wind-borne erosion and prevent possible transport of dust-born pathogens and may reduce the movement of sediment-associated pathogens.

**Animals:** Filter strips have the potential to attract wild and domestic animals for feeding, watering, breeding, and/or migration. . The type of vegetation used in the filter strip can determine the amount and type of wildlife attracted as will their proximity to open water sources and other types of habitat. Of the wild (non-domestic) Animals of Significant Risk (as defined by LGMA* Board accepted Metrics)--deer and feral pigs--filter strips do not serve as primary habitat and are unlikely to be an attractant for these species. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with filter strip include amphibians, wild and commensal birds (including waterfowl), small and large mammals and insects.

** LGMA = Leafy Greens Marketing Agreement*

## DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Consider proximity and connectivity to known habitats and existing animal populations to evaluate the likelihood that certain animals may be able to migrate to the filter strip site. Selection of plant materials for filter strips should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter or prevent animal movement may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

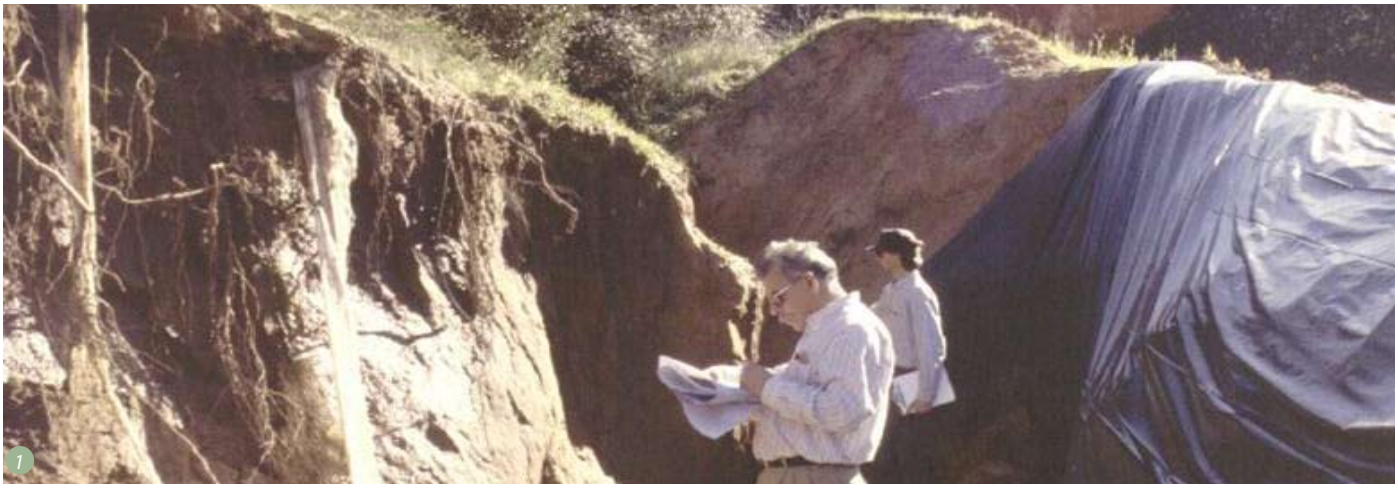
# GRADE STABILIZATION STRUCTURE

NRCS STANDARD PRACTICE CODE — 410

**Definition:** A structure used to control the grade and head-cutting in natural or artificial channels.

**Purpose:** To stabilize the grade and control erosion in natural or artificial channels, to prevent the formation or advance of gullies, to enhance environmental quality and to reduce downstream sedimentation and flooding problems.

**Criteria:** The structure must be designed for stability. The outlet must be designed and built to prevent damage to the structure or downstream areas. All applicable federal, state, and local laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 410).



*Gully head cut*

*Repaired landscape after installation of grade stabilization structure with seeded grass cover and outlet armored with placed rock*

# GRADE STABILIZATION STRUCTURE

FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed grade stabilization structure can be used to effectively reduce the movement of potentially contaminated soil prior to reaching crop land or other water bodies. By reducing the input of sediment into waterways, grade stabilization structures may also reduce the risk of downstream sediment accumulation and flooding, a potential food safety risk if contaminated water comes into contact with crop surfaces

**Air:** Practice has no known significant impact.

**Animals:** Practice has no known significant impact.

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Potential water or soil-borne sources of contamination and pathways for introduction, both on-farm and upstream, should be considered for grade stabilization structure design and placement. A grade stabilization structure should be designed to have no effect or reduce the likelihood of flooding on the ranch.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# GRASSED WATERWAY

NRCS STANDARD PRACTICE CODE — 412

**Definition:** A constructed channel that is shaped or graded to the required dimensions and planted with suitable vegetation for the stable conveyance of runoff.

**Purpose:** To convey runoff without causing erosion or flooding and to improve water quality.

**Criteria:** Amount of water conveyed will not exceed vegetated channel design with respect to erosion and flooding. Grading and seedbed preparation may result in some short-term soil loss prior to establishment of vegetative cover. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 412).


*Eroding ditch*


*Shaped waterway prior to planting*


*Vegetated waterway*

# GRASSED WATERWAY

## FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed grassed waterway can be used to effectively reduce the movement of potentially-contaminated soil as well as capture and treat potentially-contaminated water prior to reaching crop land or other water bodies. By reducing the input and movement of sediment in waterways, grassed waterways may also reduce the risk of downstream sediment accumulation and flooding, a potential food safety risk if contaminated water comes into contact with crop surfaces.

**Air:** Grassed waterways can reduce wind-borne erosion and prevent possible transport of dust-born pathogens and may reduce the movement of sediment-associated pathogens when they incorporate bank or only intermittently wetted plantings.

**Animals:** Grassed waterways have the potential to attract wild and domestic animals for feeding, watering, breeding, and/or migration. Vegetation type, water residence time and the quantity of water present in the grassed waterway along with proximity to open water sources may be determining factors for the timing and frequency in which animals may be present in or near the practice. For the wild (non-domestic) Animals of Significant Risk (as defined by LGMA* Board accepted Metrics) animals--deer and feral pigs--grassed waterways do not serve as primary habitat for any of these species. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with vegetated treatment areas include amphibians, wild/song and commensal birds, small mammals and insects.

** LGMA = Leafy Greens Marketing Agreement*

## DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

A grassed waterway should be designed to have no effect on or reduce the likelihood of flooding on the ranch. Consider proximity and connectivity to known habitats and existing animal populations to evaluate the likelihood that certain animals may be able to migrate to the grassed waterway site. Selection of plant materials for grassed waterways should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter or prevent animal movement may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# HEDGEROW

NRCS STANDARD PRACTICE CODE — 422

**Definition:** Establishing a living fence of shrubs or trees in, across, or around a field.

**Purpose:** To delineate field boundaries, attract beneficial insects, serve as fences or wind and dust barriers, establish contour guidelines, provide wildlife food and cover, provide visual screens, or improve landscape aesthetics.

**Criteria:** Species selection should be given careful consideration to minimize possible conflict between plantings and crops to be grown. Use local native or known plant sources whenever possible. Consideration should be given to flowering and otherwise attractive species as well as those providing food and cover for desired wildlife. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 422).


*Left side: Creeping wild rye filter strip. Right side: Hedgerow f*


*Hedgerow composed of Wild Rose, Toyon, Redbud*


*Left: Roadside hedgerow composed of Coyote brush and Ceanothus*


*Right: 7-year old, established roadside hedgerowf*

# HEDGEROW

FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed hedgerow with a dense herbaceous understory can be used to effectively reduce the movement of potentially-contaminated soil as well as capture and treat potentially-contaminated water prior to reaching crop land or other water bodies. By reducing the input of sediment into waterways, hedgerows with dense herbaceous understories may also reduce the risk of downstream sediment accumulation and flooding.

**Air:** Hedgerows can reduce wind-borne erosion and may reduce the movement of sediment-associated pathogens. Windbreaks with fences or vegetation can potentially impede transport of pathogens through wind and dust.

**Animals:** Hedgerows have the potential to attract wild and domestic animals for feeding, breeding, and/or migration. The type of vegetation used in the hedgerow project can determine the amount and type of wildlife attracted as will proximity to other forms of habitat and open water sources. For the wild (non-domestic) Animals of Significant Risk (as defined by LGMA* Board accepted Metrics)--deer and feral pigs--hedgerows do not serve as primary habitat. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with hedgerows include amphibians, wild/song and commensal birds, small and large mammals, and insects.

** LGMA = Leafy Greens Marketing Agreement*

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

A hedgerow project should be designed to have no effect on or reduce the likelihood of flooding on the ranch by reducing sediment movement. Hedgerows should be designed to incorporate dense ground cover to increase infiltration, minimize erosion, and provide adequate water filtering and possible treatment. Potential air-borne sources of contamination, both on-farm and upwind, as well as direction of predominant winds and proximity to cropland should be considered for hedgerow design and placement.

Consider proximity and connectivity to known habitats and existing animal populations to evaluate the likelihood that certain animals may be able to migrate to the hedgerow. Greater plant species and structural diversity will result in a greater diversity of animals attracted, thereby reducing the likelihood of getting large populations of any single species. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter or prevent animal movement may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# IRRIGATION WATER MANAGEMENT

NRCS STANDARD PRACTICE CODE — 449

**Definition:** Irrigation Water Management is the process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner.

**Purpose:** Manage soil moisture to promote desired crop response, optimize use of available water, minimize irrigation-induced soil erosion, decrease nonpoint source pollution of surface and groundwater resources, manage salts in the crop root zone and manage the air, soil or plant microclimate.

**Criteria:** Address proper irrigation scheduling, in both timing and amount, the control of runoff, and the uniform application of water. All applicable federal, state, and local laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 449).

*Catch cans set up to test irrigation distribution uniformity*

*Measuring flows to maintain manufacturer recommended pressure*

# IRRIGATION WATER MANAGEMENT

FOOD SAFETY CONSIDERATIONS

**Water:** Surface irrigation and drip systems are less likely to lead to crop contamination in cases where water sources are contaminated. By reducing excessive tailwater runoff and the input of associated sediment into waterways, irrigation water management may also reduce the risk of downstream sediment accumulation and flooding, a potential food safety risk if contaminated water comes into contact with crop surfaces.

**Air:** Practice has no known significant impact.

**Animals:** Practice has no known significant impact.

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Irrigation water may be tested to determine the probability of pathogen presence or absence, prior to application. Irrigation water management should include methods designed to increase irrigation efficiency and decrease excessive water application and subsequent tailwater runoff. Selection of an irrigation system (e.g. surface, drip, sprinkler) should consider likelihood of crop contamination; contamination may occur through direct application of contaminated water and potential to move soil-associated pathogens to the crop. If a field does become contaminated it should be cultivated and allowed to dry to increase aeration and help decrease the persistence of E.coli in the soil.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# NUTRIENT MANAGEMENT

NRCS STANDARD PRACTICE CODE — 590

**Definition:** Managing the amount, source, form, placement and timing of nutrient applications.

**Purpose:** To supply plant nutrients for optimum forage and crop yields, minimize entry of nutrients to surface and groundwater, and to maintain or improve chemical and biological condition of soil.

**Criteria:** Develop a crop nitrogen use budget for each crop in the proposed cropping sequence. Utilize tools such as the Pre-Sidedress Soil Nitrate Quick Test to maintain consistency with the predetermined budget. All applicable federal, state, and local laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 590).

*Field demonstration of Pre-Sidedress Soil Nitrate Quick Test*

*Water quality sampling of nearby subsurface water to determine nutrient levels*

# NUTRIENT MANAGEMENT

FOOD SAFETY CONSIDERATIONS

**Water:** Nutrient management can effectively inhibit pathogen presence in the soil. Proper nutrient management may increase the presence of diverse microbial organisms in the soil, thus inhibiting pathogen presence by fostering a diverse microflora.

**Air:** Practice has no known significant impact.

**Animals:** Practice has no known significant impact.

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Where feasible, management alternatives that increase soil organic matter to increase the abundance and diversity of soil microbes should be encouraged. To help reduce pathogen persistence in the soil, fertilizer or nutrient applications should not exceed the minimal amount needed for the crop. To help reduce pathogen survival in the soil when using animal-based compost or biosolids, it is important to insure the material has been properly composted prior to application and is well mixed and aerated in the soil.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# ROAD SEEDING

NRCS STANDARD PRACTICE CODE — 342 & 561

**Definition:** Roads are one of the most vulnerable areas to erosion on the farm. Road seeding throughout the winter months can help protect roads. The practice is similar in form and impact to a Critical Area Planting (NRCS Practice Code 342) and Heavy Use Area Protection (NRCS Practice Code 561).

**Purpose:** To stabilize soil, reduce damage from sediment and runoff to downstream areas, and improve visual resources.

**Criteria:** Seeding recommendations can be obtained from your local RCD or NRCS office. Adjust seeding rates at the field site to insure the required amount of pure live seed. Use straw mulch on plantings to anchor seeds in place during germination. Irrigate seed to establish grass before winter rains. All applicable federal, state, and local laws, rules and regulations must be followed (NRCS 2008, Standard Practice Codes 342 & 561).

*An eroding, unseeded road*

*Seeded Road*

# ROAD SEEDING

FOOD SAFETY CONSIDERATIONS

**Water:** Grassed roads can effectively reduce the transport of pathogens and reduce flooding through reduced erosion and sediment movement. A properly designed grassed road can be used to effectively reduce the movement of potentially contaminated soil as well as capture and treat potentially contaminated water prior to reaching crop land or other water bodies. By reducing the input of sediment into waterways, grassed roads may also reduce the risk of downstream sediment accumulation and flooding.

**Air:** Grassed roads can reduce wind-borne erosion and prevent possible transport of dust-borne pathogens and may reduce the movement of sediment-associated pathogens.

**Animals:** Grassed roads have the potential to attract wild and domestic animals for feeding, breeding, and/or migration. Wildlife attraction to grassed roads is strongly determined by the type of vegetation used and proximity to open water sources and other types of habitat. For the wild (non-domestic) Animals of Significant Risk (as defined by LGMA* Board accepted Metrics)--deer and feral pigs--grassed roads do not serve as primary habitat and are unlikely to be an attractant for these species. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with grassed roads include amphibians, wild and commensal birds (particularly ground nesting birds), small mammals and their predators, and insects.

** LGMA = Leafy Greens Marketing Agreement*

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

A grassed road should be designed to have no effect on or reduce the likelihood of flooding on the ranch. Evaluate animals that may be attracted to grassed roads based on local conditions. Selection of plant materials for grassed roads should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter or prevent animal movement may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# ROW ARRANGEMENT

NRCS STANDARD PRACTICE CODE — 557

**Definition:** Establishing a system of crop rows on planned grades and lengths primarily for erosion control and water management.

**Purpose:** To establish crop rows in direction, grade, and length that provide adequate drainage and erosion control and permit optimum use of rainfall and irrigation water.

**Criteria:** Facilitate the use of applicable field machinery. Provide for surface drainage, erosion control, and water conservation. Conditions where practice applies: 1) on sloping land, where control of the length, grade, and direction of rows can reduce soil erosion; 2) to facilitate the optimum use of water in drip or graded furrow irrigation systems; and, 3) on a surface drainage system where the rows are planned to carry excess water to surface drains .All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 557).

*Determining row arrangement in the field*

*Tractor listing beds according to calculations*

*Finished furrows maximize production efficiency and sustainability*

# ROW ARRANGEMENT

FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed row arrangement can be used to effectively reduce the movement of potentially-contaminated soil as well as divert potentially-contaminated water prior to reaching crop land or other water bodies. By reducing excessive runoff and the input of sediment into waterways, row arrangement may also reduce the risk of downstream sediment accumulation and flooding, a potential food safety risk if contaminated water comes into contact with crop surfaces.

**Air:** Practice has no known significant impact.

**Animals:** Practice has no known significant impact.

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Row arrangement should be designed to direct potentially-contaminated surface drainage away from cropped areas and waterways, directing potentially-contaminated water to a stable location where sediment, nutrients, or pathogens can be captured or filtered before entering waterways. Row arrangement should be designed to have no effect or reduce the likelihood of flooding on the ranch. Row arrangement should be designed to achieve optimal irrigation efficiency to minimize tailwater runoff.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# SEDIMENT BASIN

NRCS STANDARD PRACTICE CODE — 350

**Definition:** A basin constructed to collect and store debris or sediment. A sediment control basin has less storage capacity for peak runoff than a Water & Sediment Control Basin (638).

**Purpose:** To prevent undesirable deposition on bottom lands and developed areas.

**Criteria:** The capacity of the sediment basin shall equal the volume of sediment expected to be trapped at the site during the planned useful life or intended maintenance interval of the basin or the improvements it is designed to protect. To reduce construction costs and save space, most basins are designed to be cleared out annually. Sediment Basins will not be constructed in a stream channel or other permanent water bodies. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 350).

*Before: Pit with sediment*

*Construction process*

*After: Completed constructed Sediment Basin with trash rack on outlet riser*

# SEDIMENT BASIN

FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed sediment basin can be used to effectively divert and capture potentially-contaminated water prior to reaching crop land or other water bodies. Because sediment basins can slow the flow of surface water and collect runoff, they can be used to capture and divert contaminated run-off and potentially prevent it from entering other fields, water supplies, and surface or ground water. If E. coli bacteria have been trapped in the basin, they may persist in the sediment and application of sediment captured in sediment basins to cropland may then pose a food safety risk.

**Air:** Practice has no known significant impact.

**Animals:** Sediment basins have the potential to attract wild and domestic animals for feeding, watering, breeding, and/or migration. Water residence time and quantity of water present in or near the practice will influence animal attraction. A properly designed and maintained sediment basin is not designed to hold water except during storms or immediately after storms; therefore conditions are rarely adequate for long-term vegetated cover establishment or wildlife breeding. A properly designed and maintained sediment basin does not serve as primary habitat for any of the Animals of Significant Risk (as defined by LGMA* Board accepted Metrics), however, these species can be attracted to sediment basins as a potential water source during migration. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with sediment basins include amphibians, wild/song & commensal birds, small and large mammals and insects.

** LGMA = Leafy Greens Marketing Agreement*

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

A sediment basin should be designed to have no effect or reduce the likelihood of flooding on the ranch. Alternatives for sediment clean out, disposal and/or possible treatment to prevent the introduction of sediment-borne pathogens onto cropland should also be incorporated in the sediment basin design and management. If contaminated, basin sediment should be cultivated and allowed to dry to increase aeration and help decrease the persistence of pathogens such as E.coli in the soil prior to or after spreading on fields.

Sediment basins may be designed for reduced water detention time (typically they drain within 48 hours) which should prevent establishment of permanent aquatic vegetation and reduce animal attraction. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter animal use may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# STREAM BANK PROTECTION

NRCS STANDARD PRACTICE CODE — 580

**Definition:** Treatments used to stabilize and protect banks of streams or constructed channels, and shorelines of lakes, reservoirs, or estuaries.

**Purpose:** To prevent the loss of land or facilities adjacent to banks; to maintain the flow or storage capacity of the water body; to reduce the offsite or downstream effects of sediment resulting from bank erosion; to improve or enhance the stream corridor for fish and wildlife habitat, aesthetics and recreation.

**Criteria:** Measures must be installed according to a site-specific plan that considers anticipated stream flows, soil stability, and wildlife protection concerns. Protective measures must be used to minimize disturbance to wildlife and water quality during construction. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 580).

*Rock riprap with willow plantings*

*Willow wall revetment with brush mattress keyed into bank with quarried rock*

# STREAM BANK PROTECTION

## FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed stream bank protection project can be used to reduce the movement of potentially-contaminated soil as well as capture and treat potentially-contaminated water prior to reaching crop land or other water bodies. By reducing the input and movement of sediment in waterways, bank protection projects may also reduce the risk of downstream sediment accumulation and flooding.

**Air:** Stream bank protection projects can reduce wind-borne erosion and prevent possible transport of dust-borne pathogens and may reduce the movement of sediment-associated pathogens when they incorporate bank or only intermittently wetted plantings.

**Animals:** Vegetated banks have the potential to attract wild and domestic animals for feeding, watering, breeding, and/or migration partly determined by the type of vegetation used, quantity of water present in or near the practice and proximity to other types of habitat. For the wild Animals of Significant Risk (as defined by LGMA Board accepted Metrics)--deer and feral pigs--stream bank protection projects do not serve as primary habitat. Because of its potential as a food source and shelter, however, vegetation used in bank protection projects may attract animals. Animals not considered of Significant Risk (by LGMA* Metrics) potentially associated with vegetated bank protection projects include waterfowl, amphibians, wild/song and commensal birds, small and large mammals, and insects.

** LGMA = Leafy Greens Marketing Agreement*

## DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

For potentially treating contaminated surface flow prior to reaching a waterway, a bank protection project should be situated in a location that can receive that drainage. For potentially treating contaminated flow within a waterway, a bank protection project should include vegetation within the waterway. A bank protection project should be designed to have no effect on or reduce the likelihood of flooding. Bank protection projects should be designed to incorporate dense ground cover on banks or intermittently wetted areas to minimize on-site dust movement (when dry). Consider connectivity to known habitats and animal populations to evaluate the likelihood that certain animals may be able to migrate to the bank protection site. Greater plant species and structural diversity will result in a greater diversity of animals attracted, thereby reducing the likelihood of getting large populations of any single species. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter or prevent animal movement may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# TAILWATER RECOVERY SYSTEM

NRCS STANDARD PRACTICE CODE — 447

**Definition:** Facility to collect, store and transport irrigation tailwater for reuse in farm irrigation distribution system.

**Purpose:** Capture and store irrigation runoff for reuse as well as acting as a sediment and nutrient detention basin.

**Criteria:** Must predict irrigation runoff rate and sediment load to design sediment storage reservoir and determine pump capacity. Outlet must be designed and built to handle emergency overflow. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 447).

*Collection reservoir with multiple inlets and storm water overflow outlet*

*Filtration station utilizing particulate filtration and UV sterilization*

*Water storage tanks for reuse or blending with other water sources*

# TAILWATER RECOVERY SYSTEM

FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed tailwater recovery system can be used to effectively divert and capture potentially-contaminated water prior to reaching crop land or other water bodies. By reducing the input of water and associated sediment into waterways, tailwater recovery systems may also reduce the risk of downstream sediment accumulation and flooding. Reuse of drainage water from contaminated fields poses a potential risk for onsite crop contamination. If E. coli bacteria have been trapped in the tailwater recovery system, they may persist in the sediment and application of sediment captured in the system to cropland may then pose a food safety risk.

**Air:** Practice has no known significant impact.

**Animals:** Tailwater recovery systems have the potential to attract wild and domestic animals for feeding, watering, breeding, and/or migration partly depending on water residence time and quantity of water present in or near the practice. Tailwater recovery systems do not serve as primary habitat for any of the Animals of Significant Risk (as defined by LGMA* Board accepted Metrics); however, these species can be attracted to tailwater systems as a potential food and water source. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with tailwater recovery systems include amphibians, wild/song and commensal birds, small and large mammals and insects. According to wildlife biologists, waterfowl and amphibians may use the tailwater recovery system as habitat, reproduce in or nearby them, and/or utilize them when migrating. Waterfowl and amphibian use depends largely on aquatic habitat and vegetation available.

** LGMA = Leafy Greens Marketing Agreement*

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

The design and management of a tailwater recovery system should allow for possible filtering, treating, and testing of recovered tailwater prior to applying it to crops. Alternatives for sediment clean out, disposal and/or possible treatment to prevent the introduction of sediment-borne pathogens onto cropland should also be incorporated. Tailwater recovery systems may also be designed to include pathogen-reducing features such as vegetated treatments (see Vegetated Treatment Areas, Grassed Waterways).

Evaluate animals that may be attracted to tailwater system based on local conditions. Selection or management of plants in the tailwater recovery system should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. Methods to deter or prevent animal movement should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# UNDERGROUND OUTLET

NRCS STANDARD PRACTICE CODE — 620

**Definition:** A structure used to control the grade and head-cutting in natural or artificial channels.

**Purpose:** To stabilize the grade and control erosion in natural or artificial channels, to prevent the formation or advance of gullies, to enhance environmental quality and to reduce downstream sedimentation and flooding problems.

**Criteria:** The structure must be designed for stability. The outlet must be designed and built to prevent damage to the structure or downstream areas. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 620).

*Construction of pipe trench*

*Underground outlet pipe trench with anti-seepage collar*

*Pipe for outlet is installed*

*Riser protruding from underground outlet that will collect surface water and transport it through underground outlet to energy dissipation apron of quarried rock*

# UNDERGROUND OUTLET

FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed underground outlet can be used to effectively reduce the movement of potentially-contaminated soil as well as divert potentially-contaminated water prior to reaching crop land or other water bodies. An underground outlet has the potential to be an effective type of runoff diversion treatment and may safely transport surface runoff past isolated contaminated areas. By reducing the input of sediment into waterways, underground outlets may also reduce the risk of downstream sediment accumulation and flooding, a potential food safety risk if contaminated water comes into contact with crop surfaces.

**Air:** Practice has no known significant impact.

**Animals:** Practice has no known significant impact.

DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

An underground outlet should outlet in a stable location where sediment, nutrients, or pathogens can be captured or filtered before entering waterways. Underground outlets should not contribute to any overland flow on adjacent cropland.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# VEGETATED TREATMENT AREA

NRCS STANDARD PRACTICE CODE — 635

**Definition:** A component of an agricultural waste management system consisting of an area of permanent vegetation used for agricultural wastewater treatment.

**Purpose:** To improve water quality by reducing the loading of nutrients, organics, pathogens, and other contaminants associated with animal manure and other contaminated runoff and process water generated from livestock, poultry, and other agricultural operations.

**Criteria:** Base the total treatment area for the Vegetated Treatment Area (VTA) on the soil's capacity to infiltrate and retain runoff within the root zone and the vegetation's nutrient requirements. Permanent vegetation consisting of a single species or mixture that is adapted to the soil and climate shall be established in the treatment area. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 635).

*Where flooding or conveyance capacity is not a limiting factor, vegetation can provide effective nutrient and sediment capture in existing drainage systems*

*Recently planted emergent ditch vegetation*

*Vegetated Treatment Area with established floating vegetation*

# VEGETATED TREATMENT AREA

## FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed VTA can be used to effectively reduce the movement of potentially-contaminated soil as well as capture and treat potentially-contaminated water prior to reaching crop land or other water bodies. By reducing excessive runoff and the input of sediment into waterways, VTAs may also reduce the risk of downstream sediment accumulation and flooding. Treatments utilizing vegetation have been shown to have significantly lower levels of microbial pathogens compared to non-vegetated waterways.

**Air:** Vegetated treatment areas can reduce wind-borne erosion and reduce the movement of sediment-associated pathogens when they incorporate bank or only intermittently wetted plantings.

**Animals:** VTAs have the potential to attract wild and domestic animals for feeding, watering, breeding, and/or migration. Wildlife attraction to vegetated treatment areas is strongly determined by the type of vegetation used, water quantity and residence time, and proximity to open water sources and other types of habitat. For the wild (non-domestic) Animals of Significant Risk (as defined by LGMA* Board accepted Metrics)--deer and feral pigs--vegetated treatment areas do not serve as primary habitat. Animals not considered to be of Significant Risk (by LGMA Metrics) potentially associated with vegetated treatment areas include amphibians, wild/song and commensal birds, small mammals and insects.

** LGMA = Leafy Greens Marketing Agreement*

## DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Pathogens of concern should be identified and the VTA designed to target the capture and treatment of these constituents of concern, as feasible. A vegetated treatment area should be designed to have no effect or reduce the likelihood of flooding on the ranch. VTAs should be designed to incorporate dense ground cover on banks or intermittently wetted areas to minimize on-site dust movement (when dry).

Selection of plant materials for VTAs should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. Low-growing perennial grasses provide less cover and are therefore less likely to attract large animals. If animal concerns cannot be addressed through vegetation selection and management alone, other methods to deter or prevent animal movement may be used and should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# WATER CONTROL BASIN

NRCS STANDARD PRACTICE CODE — 538

**Definition:** A sediment basin or off stream pond constructed to capture sediment as well as handle excess runoff and sediment from farmed or developed parcel.

**Purpose:** Detain water and retain sediment that is associated with runoff from a developed parcel where sufficient area is available for temporary storm runoff storage capacity.

**Criteria:** Must be sized to accommodate the sediment load and excess runoff above natural predicted runoff. In addition, a primary spillway and an emergency spillway must be installed to prevent basin failure. All applicable laws, rules and regulations must be followed (NRCS 2008, Standard Practice Code 638).

*Construction of the basin with a 2:1 ratio slide slope*

*Diversion ditch leading into the water basin*

*Water basin with channel diverting water into the basin*

*Completed basin*

# WATER CONTROL BASIN

## FOOD SAFETY CONSIDERATIONS

**Water:** A properly designed WSC basin can be used to effectively divert and capture potentially-contaminated water prior to reaching crop land or other water bodies. Because WSC basins can slow the flow of surface water and collect runoff, they can be used to capture and divert contaminated run-off and potentially prevent it from entering other fields and surface or groundwater supplies. By reducing the input of water and associated sediment into waterways, WSC basins may also reduce the risk of downstream flooding. If E. coli bacteria have been trapped in the basin, they may persist in the sediment and application of sediment captured in WSC basins to cropland may then pose a food safety risk.

**Air:** Practice has no known significant impact.

**Animals:** Water and sediment control basins have the potential to attract wild and domestic animals for feeding, watering, breeding, and/or migration. A properly designed and maintained WSC basin is not designed to hold water except during storms or immediately after storms; therefore conditions are rarely adequate for long-term vegetated cover establishment or wildlife breeding. A properly designed and maintained WSC basin does not serve as primary habitat for any of the Animals of Significant Risk (as defined by LGMA* Board accepted Metrics); however, these species can be attracted to WSC basins as a potential water source during migration. Animals not considered of Significant Risk (by LGMA Metrics) potentially associated with WSC basins include amphibians, wild and commensal birds, small and large mammals and insects; their presence is largely determined by the quantity and residence time of water in or near the practice, and emergent and upland vegetation characteristics.

** LGMA = Leafy Greens Marketing Agreement*

## DESIGN AND MANAGEMENT CONSIDERATIONS TO REDUCE FOOD SAFETY RISK:

Alternatives for sediment clean out, disposal and/or possible treatment to prevent the introduction of sediment-borne pathogens onto cropland should also be incorporated in the WSC basin design and management. Evaluate animals that may be attracted to water and sediment control basins based on local conditions. WSC basins may be designed for reduced water detention time which should prevent establishment of permanent aquatic vegetation and reduce attraction. Selection or management of plants in a WSC basin should consider the potential to deter or attract animals that present significant food safety risk in relation to its importance for practice design and function. Methods to deter or prevent animal movement should target the species of concern while minimizing or avoiding negative impacts to other species and the environment.

*This information is summarized from Food Safety Considerations for Conservation Planners: A Field Guide for Practitioners and should be used only as a quick reference for possible benefits or risks for food safety. Please see the full text for more detailed information. (Available from RCD of Monterey County and www.rcdmonterey.org.) This is not intended to be a how-to or design guide for conservation practices. Individual practices must meet minimum standards and comply with local laws and regulations. When designing or managing conservation practices and environmental features to minimize food safety risk, please consult the appropriate experts. This guide is not intended to be used to determine on-farm risk of crop contamination and should not be used in place of a crop-specific food safety program.*

# TECHNICAL ASSISTANCE CONTACTS

| | |
|---|---|
| **MONTEREY COUNTY:** | |
| Resource Conservation District of Monterey County | 831-424-1036 x124 |
| USDA Natural Resources Conservation Service | 831-424-1036 x101 |
| University of California Cooperative Extension | 831-759-7350 |
| Community Alliance with Family Farmers | 831-761-8507 |
| Monterey County Farm Bureau | 831-751-3100 |
| Monterey County Agricultural Commissioner | 831-759-7325 |
| Monterey County Water Resources Agency | 831-755-4860 |
| **SANTA CRUZ COUNTY:** | |
| Resource Conservation District of Santa Cruz County | 831-464-2950 |
| USDA Natural Resources Conservation Service | 831-475-1967 |
| University of California Cooperative Extension | 831-763-8040 |
| Santa Cruz County Farm Bureau | 831-724-1356 |
| Santa Cruz County Agricultural Commissioner | 831-763-8080 |
| **SAN MATEO COUNTY:** | |
| San Mateo Resource Conservation District | 650-712-7765 |
| USDA Natural Resources Conservation Service | 650-726-4660 |
| University of California Cooperative Extension | 650-726-9059 |
| San Mateo County Farm Bureau | 650-726-4485 |
| San Mateo County Agricultural Commissioner | 650-363-4700 |
| **SAN LUIS OBISPO COUNTY:** | |
| Upper Salinas-Las Tablas Resource Conservation District | 805-434-0396 x4 |
| Coastal San Luis Resource Conservation District | 805-771-9835 |
| USDA Natural Resources Conservation Service | 805-434-0396 x3 |
| University of California Cooperative Extension | 805-781-5940 |
| San Luis Obispo County Farm Bureau | 805-543-3654 |
| San Luis Obispo Agricultural Commissioner | 805-781-5910 |
| Central Coast Vineyard Team | 805-369-2288 |
| **SAN BENITO COUNTY:** | |
| San Benito County Resource Conservation District | 831-637-4360 x101 |
| USDA Natural Resources Conservation Service | 831-637-4360 x3 |
| University of California Cooperative Extension | 831-637-5346 |
| San Benito County Farm Bureau | 831-637-7643 |
| San Benito County Agricultural Commissioner | 831-637-5344 |

SANTA CLARA COUNTY:

| | |
|---|---|
| Loma Prieta Resource Conservation District | 408-847-4171 |
| USDA Natural Resources Conservation Service | 831-637-4360 x3 |
| University of California Cooperative Extension | 408-282-3110 |
| Santa Clara County Farm Bureau | 408-776-1684 |
| Santa Clara County Agricultural Commissioner | 408-918-4600 |

SANTA BARBARA COUNTY:

| | |
|---|---|
| Cachuma Resource Conservation District | 805-928-9269 |
| USDA Natural Resources Conservation Service | 805-928-9269 |
| University of California Cooperative Extension | 805-781-5940 |
| Santa Barbara County Farm Bureau | 805-688-7479 |
| Santa Barbara County Agricultural Commissioner | 805-934-6200 |